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FOREST RESOURCES IN THE LONGLEAF PINE REGION OF MISSISSIPPI AND EAST LOUISIANA

by
E. B. Faulks
Associate Forest Economist

A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The nation-wide Forest Survey, being conducted by the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928. Its five-fold object is: (1) to make an inventory of the present supply of timber and other forest products; (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probably future trend in the requirement for timber and other forest products; and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of land suitable for forest production.

This release, is based on a field survey made Aug. 4, 1934, to March 30, 1935, and two field canvasses of forest industrial plants to determine forest drain, the last of which was made during May 1937. It should be regarded only as a progress report since it contains Forest Survey data that will be included in complete reports to be published later, and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the presentation of these survey data, it is to be noted that owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Assisting Staff

P. R. Wheeler, Associate Forest Economist
In Charge of Computations

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FOREST RESOURCES IN THE LONGLEAF PINE REGION OF MISSISSIPPI AND EAST LOUISIANA

General Description

The area discussed in this report is formed by contiguous parts of Mississippi and Louisiana lying in the Gulf Coast and Lake Pontchartrain region; it includes 17 counties in southeast Mississippi and most of 5 Louisiana parishes between the Amite and Pearl Rivers (fig. 1). These areas, designated as Survey units Mississippi #4 and Louisiana #4, respectively, are characterized by longleaf and slash pine forests.

These units, which form the western extremity of the principal naval stores belt, have common economic interests and uniform geophysical features that warrant their consolidation in a study of their forest resources and industries. They form an area of 8,081,300 acres, about 79 percent of which is forested (table 1). The lumber production in 1936 was 628 million board feet. Hattiesburg, Laurel, Biloxi, and Gulfport in Mississippi, and Bogalusa in Louisiana are the largest cities and principal industrial centers, while the influence of New Orleans and Mobile as financial and market centers, and as terminals of land- and water-transport systems, is felt throughout the entire area.

Topography varies with the distance from the Coast, the higher, more hilly country lying in the northern portion. Elevations reach a maximum of 400 feet in Covington County, Miss., and decrease gradually toward the south, the rolling terrain finally levelling out into a narrow belt of flatwoods and marshes along the Coast. Most of the region is drained by the Pascagoula and Pearl Rivers, which flow south to the Gulf. Numerous smaller streams, independent of the two larger systems, drain limited watersheds along the Coast. The sandy and loamy clay soils are moderately well drained except in the belt of flatwoods, where an insufficient gradient causes surface water to accumulate during the winter and spring. Moderate sheet erosion is general, and occasional gullying occurs on farm land in the rolling uplands.

The development of transportation facilities has been commensurate with the needs of the area. Five major railroads, with terminals in New Orleans, Mobile, and Gulfport, touch all the principal cities, and feeder lines traverse every county. Several common carriers operated by lumber companies supplement this service in the less populated areas. Excellent paved highways are in service in all parishes of the Louisiana unit, and virtually all roads appearing on ordinary road maps are usable the year round. In Mississippi pavement is limited to the relatively few arterial highways that extend from New Orleans and Gulfport toward the east and north, but all the important towns are connected by all-weather gravel roads, and the present state road program provides for construction of modern highways in many counties. Considerable tonnage in wood products, construction materials, and garden truck is handled by barge lines and shallow draft vessels in coastwise trade.

Climatic conditions favor a long growing season. The average winter temperature is 53° F.; the summer average is 81°. The annual rainfall averages about 60 inches, the fall months being the driest.

Table 1. - Land area classified according to use

Land use	Area		Proportion of total area	
	Acres		Percent	
Forest		6,414,700		79.4
Agriculture:				
In cultivation	1,171,300		14.5	
Out of cultivation:				
Idle, abandoned, and improved pasture	249,700		3.1	
Total		1,421,000		17.6
Other nonforest		245,600		3.0
Total land area		8,081,300		100.0

The 1930 Census recorded a population of more than 418,000 people (31 percent negro), an increase of 17 percent over 1920. In six of the more rural Mississippi counties, however, decreases were recorded. The five largest cities were all under 20,000 population. The rural character of the region is further emphasized by the fact that 74 percent of all residents live on farms or in small communities under 2,500 population. According to the Census, agriculture employed 44 percent of the 152,700 gainful workers, 12 percent were engaged in various wood-using industries, and the remaining 44 percent were employed in other industries. It should be pointed out that in 1935 part-time work of some kind was engaged in by 32 percent of all farm operators, or more than 14,000, who worked 1 or more days in non-farm occupations.

The Federal Unemployment Census taken in November 1937, shows that 25,400 people were unemployed and wanted work. Approximately 10,200 were working on Government relief projects, and about 15,500 were working part time but desired more work[1/].

Agriculture is of prime importance to the region. In 1935, according to the Agricultural Census, nearly 45,000 farms occupied a gross area of about 2,870,000 acres, an increase over 1930 of about 6,000 farms and of 280,000 acres. About half the gross farm acreage (1,480,000 acres) is in woodland. Measured by its value in 1934, agriculture rated as the "big business" of the region, with land and buildings valued at more than 56 million dollars. General farming is practiced over most of the area, with corn, cotton, hay, potatoes, and sugarcane the most common crops. Pecans, tung nuts, strawberries, and citrus fruits are special crops. Unlike other parts of Mississippi and Louisiana, or indeed most of the agricultural South, only

1/ Federal Unemployment Census. John D. Biggers, Administrator, Washington, D. C., Nov. 1937.

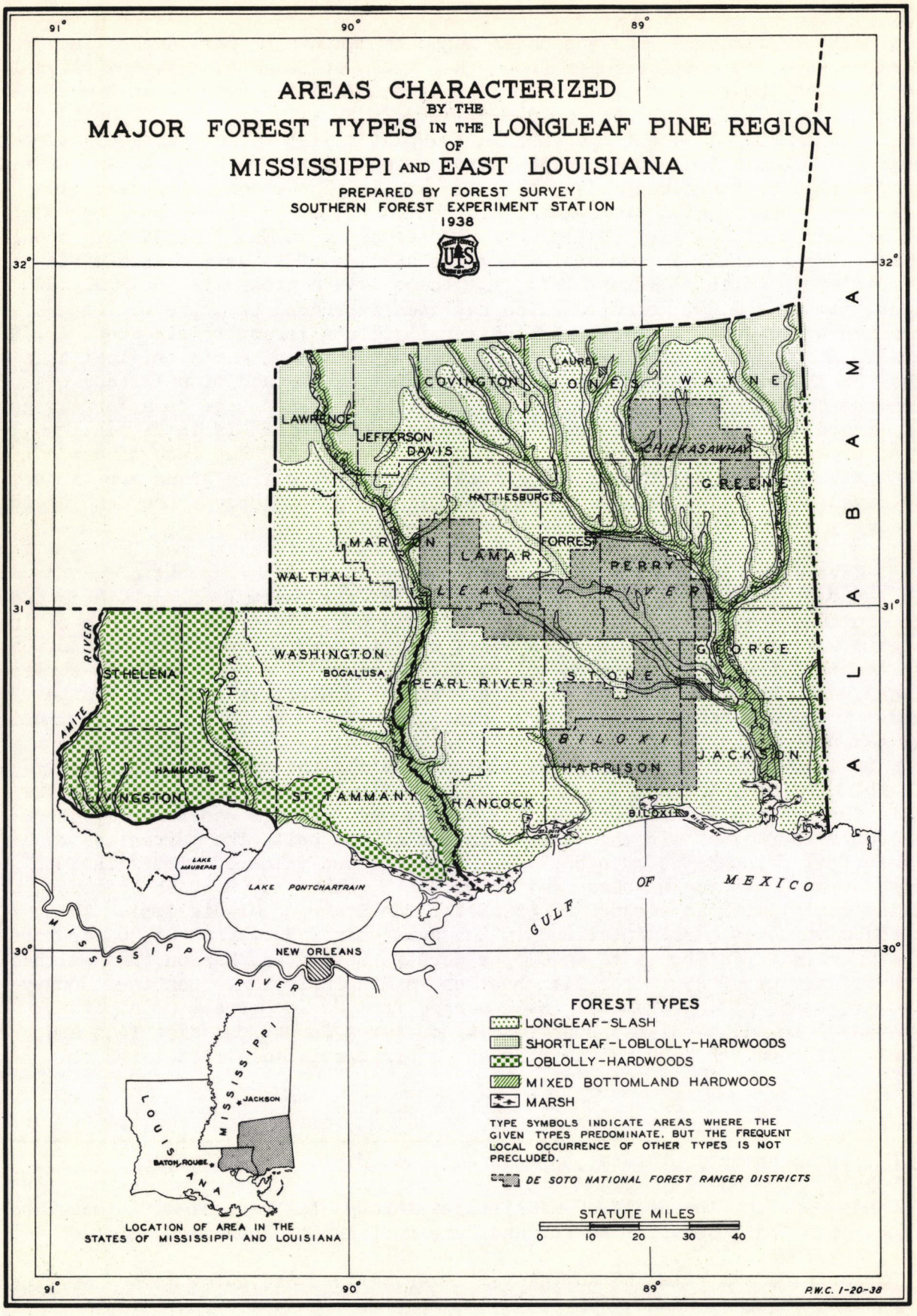

FIGURE 1 - FOREST TYPE MAP.

30 percent of the farm land was under lease to tenants or part owners in 1935. Sharecroppers, as distinguished from other types of tenants, operated slightly less than 10,000 farms[2].

Ownership of forest land has in the past rested largely with big lumber companies. Large individual holdings, many in excess of 100,000 acres, have been carried by these companies while the virgin timber was being cut. In more recent years, with the removal of the timber, large blocks have been subdivided and sold for farm development. Other areas in Mississippi have been sold to the Federal Government to form the nucleus of three ranger districts of the DeSoto National Forest (fig. 1); these have a gross area of 1,212,820 acres, almost 460,000 acres of which has been purchased or approved for purchase up to June 30, 1937. The University State Forest totals about 22,200 acres. A few owners have retained a large proportion of their original holdings for the express purpose of growing and harvesting additional crops of timber. Notwithstanding the fact that the virgin stands have been largely cut off, there are still many large ownerships of forest land in the 4 million acres or more of non-farm, privately-owned forest land. The lack of demand for agricultural land; the growing market for pulpwood, low-grade saw timber, and naval stores timber; and the hope of oil-field development are tending to hold many large forest land ownerships intact.

Reversion of forest land to state ownership for non-payment of taxes has been going on for many years as a result of the removal of the timber and the shutting down of the larger sawmills. Whether this trend continues or is checked will depend upon the replacement of the forests through reforestation and the reviving of forest industries, the possible development of sub-surface values, and the adjusting of tax charges to the productive capacity of the land. Local governments have suffered severely from the loss of their principal tax base——the forests. According to a report by C. O. Henderson and John T. Caldwell,[3] 10 to 21 percent of the total land area of Lawrence, Greene, Harrison, Marion, George, Perry, and Stone Counties was owned by the State through tax reversion on Jan. 1, 1936; most of this was formerly owned by lumber companies. In the other counties of the unit, the percentage of tax-forfeited lands was much smaller. The assessed value of timber in 1936 ranged from $2.25 per M board feet in Walthall County to $8.80 in Jefferson Davis County, with an average of $3.48 for the State of Mississippi. The assessed value of bare timberland in the same year ranged from $1.35 per acre in Jefferson Davis County to $4.00 per acre in Covington, Marion, and Walthall with an average of $3.42 for all counties in Mississippi[4]. Combined county-wide and State millage rates in 1934 ranged from 22 in Forrest County to 43 in Stone. In addition, all counties impose taxes for school districts and nearly all counties also impose road and other special-district taxes.

2/ A graphic summary of farm tenure. U.S.D.A. Misc. Publ. #261, pp. 5, 11. Dec. 1936.

3/ Lands owned by the State of Mississippi through tax reversion. Mimeograph #4, U.S.D.A. Farm Security Admin. and Bureau of Agric. Economics, Little Rock, Ark., Nov. 1937.

4/ Property assessments and ad valorem taxes. Miss. State Tax Comm. Service Bull. #18, Jackson, Miss., July 1937.

Description of the Forest

The Forest Survey classed as rolling uplands 67 percent (4,297,900 acres), uniformly distributed over the region except for a narrow belt bordering Lake Pontchartrain and the Gulf of Mexico. The low, level strip of land along the coast, aptly termed flatwoods, is limited to 730,400 acres, representing about 11 percent of the total forest area. The remaining 22 percent lies in the swamps and alluvial bottoms of the creeks and rivers distributed throughout the area.

Forest types

In general, there are three major associations of tree species in these units: The turpentine pines (longleaf and slash), the nonturpentine pines (loblolly, shortleaf, and spruce pines), and the hardwoods, including cypress (fig. 1). The turpentine pines dominate about 53 percent of the forest area. Here longleaf pine is the most abundant and widespread, occupying about 75 percent of the area in the type. Toward the northern and western boundaries of the region, this species mingles with increasing quantities of loblolly pine and hardwoods, which together finally form the dominant forest type. In the past 75 years, this transition zone has been creeping slowly toward the south and east, resulting in considerable shrinking of the commercial range of longleaf pine. Within the territory covered by this report, the loblolly-shortleaf-hardwood mixture occupies approximately 27 percent of the forest area. Slash pine occurs in greatest quantity in the southern part of the region, particularly in the flatwoods belt, where it mixes with tupelo gum and cypress in the shallow ponds and drains. Slash pine also forms a mixed type with longleaf, and under favorable conditions has completely replaced it. Loblolly pine and small quantities of shortleaf and spruce pine (Pinus glabra Walter) with gums, bay, and oak occasionally in mixture, occur in scattered locations in the southern part of the area.

The remaining 20 percent of the forest acreage is occupied by hardwood types.5/ Along the banks of streams and rivers, particularly the Pearl and Pascagoula, the oaks, gums, bays, magnolias, and other bottom-land hardwoods form a forest association which totals 773,600 acres and is the source of most of the volume of valuable hardwood cut in these Survey units. A poorer grade of oaks, gums, and hickories frequently is found mixed with pine in the 207,100 acres in the rolling uplands, while blackjack and other scrub oaks have completely excluded the commercially valuable species on 304,400 acres in the central and southern tiers of counties previously occupied by longleaf pine.

The 12 forest types recognized in the field have been grouped into 3 major associations which are dominant in large areas, as shown on the accompanying type map (fig. 1). Within these broad ranges, many areas of different but less prevalent forest types and of agricultural land are intermingled. The all-inclusive acreage characterized by major type-groups, as shown on the map, therefore, cannot be compared with type-area figures based on the actual

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5/ The cypress type, which occupies a relatively small area, is arbitrarily included in this report with the hardwood types.

determination in the field. It should be pointed out also that the shortleaf pine component of the loblolly-shortleaf-hardwood type is insignificant in this territory, the total cubic volume of this species accounting for only 7 percent of the aggregate pine volume inventoried. Its location is restricted principally to scattered patches in the northern tier of counties in the Mississippi unit.

In figure 2 is shown the distribution of the total stand of sound pine and hardwood trees by diameter-classes. This distribution, showing a large proportion of the trees in the lower diameter-classes, is typical of areas from which the mature timber has been largely removed and in which second growth is taking possession of the soil.

Forest conditions

Table 2 reveals a number of significant points characteristic of the forests of this region. The acreage of uncut old-growth turpentine pine, principally longleaf, is negligible in a region where the forest area is dominated by that forest type. The method of cutting used in the past has left clear-cut about 1 out of every 4 acres of the turpentine pine types—a total of 865,700 acres. A much brighter side of the picture is indicated by the extensive acreage of fast-growing second growth, which occupies more than 73 percent of the total forest area. Over 3 million acres—approximately 67 percent of the second-growth area, or 49 percent of the total forest area—bears only small saplings and reproduction. This statement is probably the most significant of any concerning the forest conditions, since it establishes the immature character of the general stands and dictates, to a large extent, the management—principally protection from fire—necessary to maintain an adequate future supply of timber. Also it foreshadows somewhat the acute shortage in high-quality pine saw timber which is likely to obtain in this territory for the next several decades.

The important timber areas of immediate interest to the wood-using industries are those in scattered old-growth stands and the large areas of sawlog-size second growth, with a combined area of 2,365,700 acres. Confined to no definite location or consolidated body, these stands are scattered mainly in the rolling uplands throughout the region, especially in the more rural counties of the Pearl and Pascagoula basins.

The area of forest in the under-sawlog-size second-growth condition (2,390,500 acres) bears but little timber of immediate use to the lumber industry, although a number of small mills are currently "scrapping up" residual trees and the larger second-growth trees in this area. If properly cared for, however, it will be of prime importance as a future source of supply for pulpwood, saw timber, and naval stores.

The total area classified as reproduction includes 756,900 acres mainly in the pure turpentine pine types, where the reproduction on 17 percent of the area was classified as satisfactory, having 900 or more well-distributed seedlings per acre; on 35 percent, as fair; and on 48 percent as poor, with less than 300 poorly distributed seedlings per acre. In the non-turpentine pine type, stocking was satisfactory on 23 percent of the reproduction area, fair on 36 percent, and poor on 41 percent.

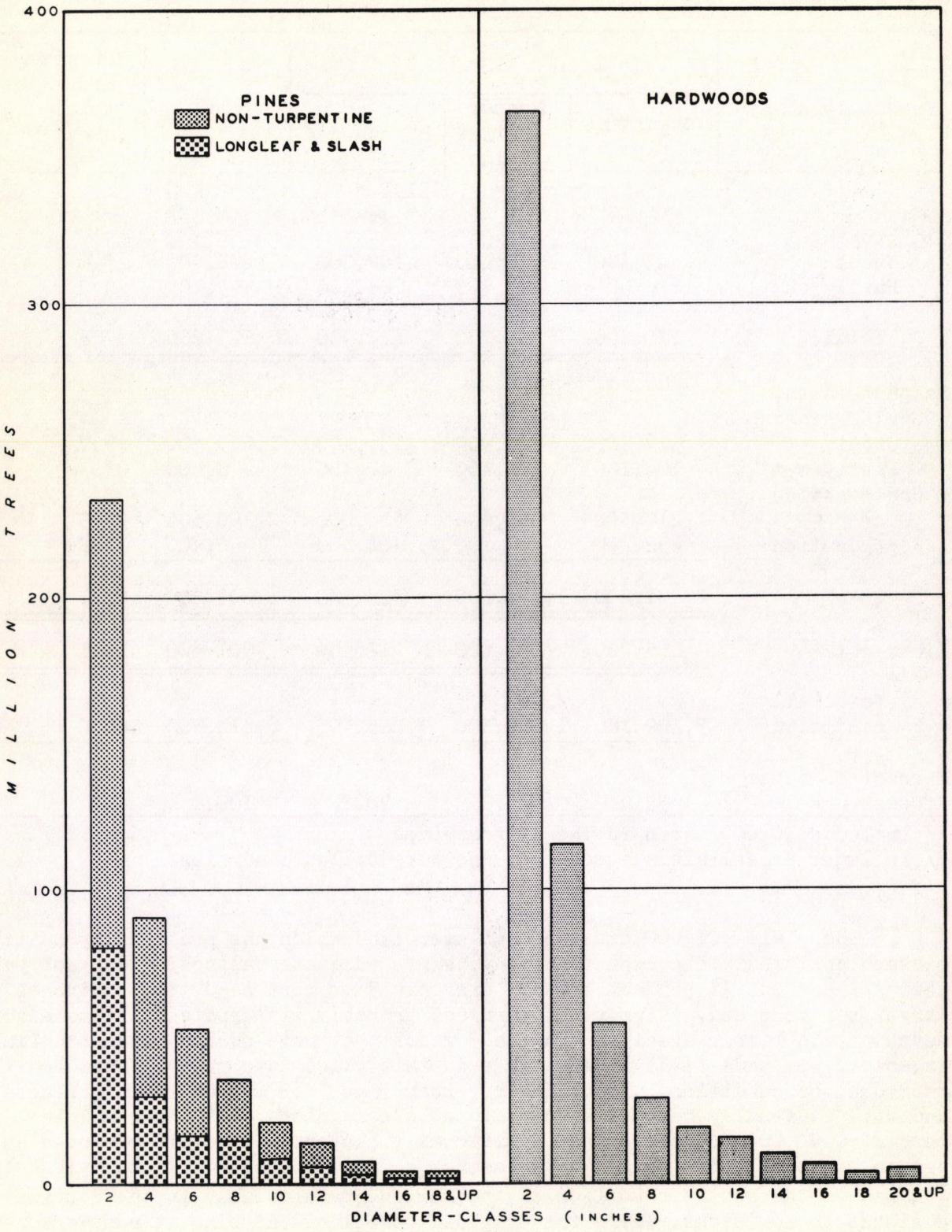

FIGURE 2 — STAND DIAGRAMS

Table 2. - Forest area classified according to forest condition and type-group

Forest condition	Forest type-group			Total	Percent of total forest area
	Turpentine pine	Nonturpentine pine	Hardwood[1]		
	Acres				
Old growth:					
Uncut	43,300	28,400	157,000	228,700	3.6
Partly cut	228,900	77,300	286,900	593,100	9.2
Total	272,200	105,700	443,900	821,800	12.8
Second growth:					
Sawlog size:					
Uncut	322,200	746,900	196,200	1,265,300	19.7
Partly cut	106,100	130,400	42,100	278,600	4.3
Under sawlog size	1,210,500	654,000	526,000	2,390,500	37.3
Reproduction	632,400	60,100	64,400	756,900	11.8
Total	2,271,200	1,591,400	828,700	4,691,300	73.1
Clear-cut [2]	865,700	23,400	12,500	901,600	14.1
Total all conditions	3,409,100	1,720,500	1,285,100	6,414,700	100.0
Percent of total forest area	53.2	26.8	20.0	100.0	

1/ Includes 40,600 acres in the cypress type.
2/ Includes a negligible acreage in the fire-killed condition.

There are 901,600 acres of cut-over land which has practically no timber and no immediate prospects of any, since adequate restocking has not yet taken place; but 25 percent of this area has 3 or more seed trees 6 inches or larger per acre and, if properly managed, probably will restock ultimately to merchantable timber species. In the 3 years that have passed since the field inventory was made (1935), many acres in this class have probably entered the reproduction condition. Thirty-four percent has 1 or 2 seed trees per acre and will eventually restock under favorable conditions, but the remaining 41 percent (370,000 acres) must be artificially restocked if desirable species are to be established within any reasonable time. Much of this bare land is located in the southern portion of the region, particularly in the Florida parishes in Louisiana, where the original pure longleaf pine stands were removed completely and fires have been of regular occurrence. In Pearl River County about 10,000 acres of such land recently has been placed under cultivation for the production of tung trees.

Although only a very small acreage was classed as fire-killed, much of the area is burned each year in spite of the protective efforts of private, State, and Federal agencies. The Mississippi Forest Service has established protection areas totaling 1,213,600 acres in 5 of the 17 counties. In the Louisiana parishes more than 1,600,000 acres are under protection. The United States Forest Service maintains an intensive fire-control system, including a short-wave radio network covering all land within the national forest boundaries. Of the total forest acreage in these two Mississippi-Louisiana survey units, about 60 percent is under fire protection.

To point out the deficiencies in the present forest as compared with the forest attainable through sustained-yield management, the existing age-class and volume distribution has been compared in figure 3 with the distribution in a well-managed forest on a 70-year rotation. The green area, representing the present forest stand, is based upon a rough determination of the age-classes and volumes per acre in turpentine pine types. The upper dotted lines, which represent the attainable forest, show an equal distribution of the same area among seven 10-year age-classes and the volume which might be expected if the area were placed under good forest management, based upon the heaviest stocked 10 percent in each age-class on weighted-average sites in the present uncut stand.

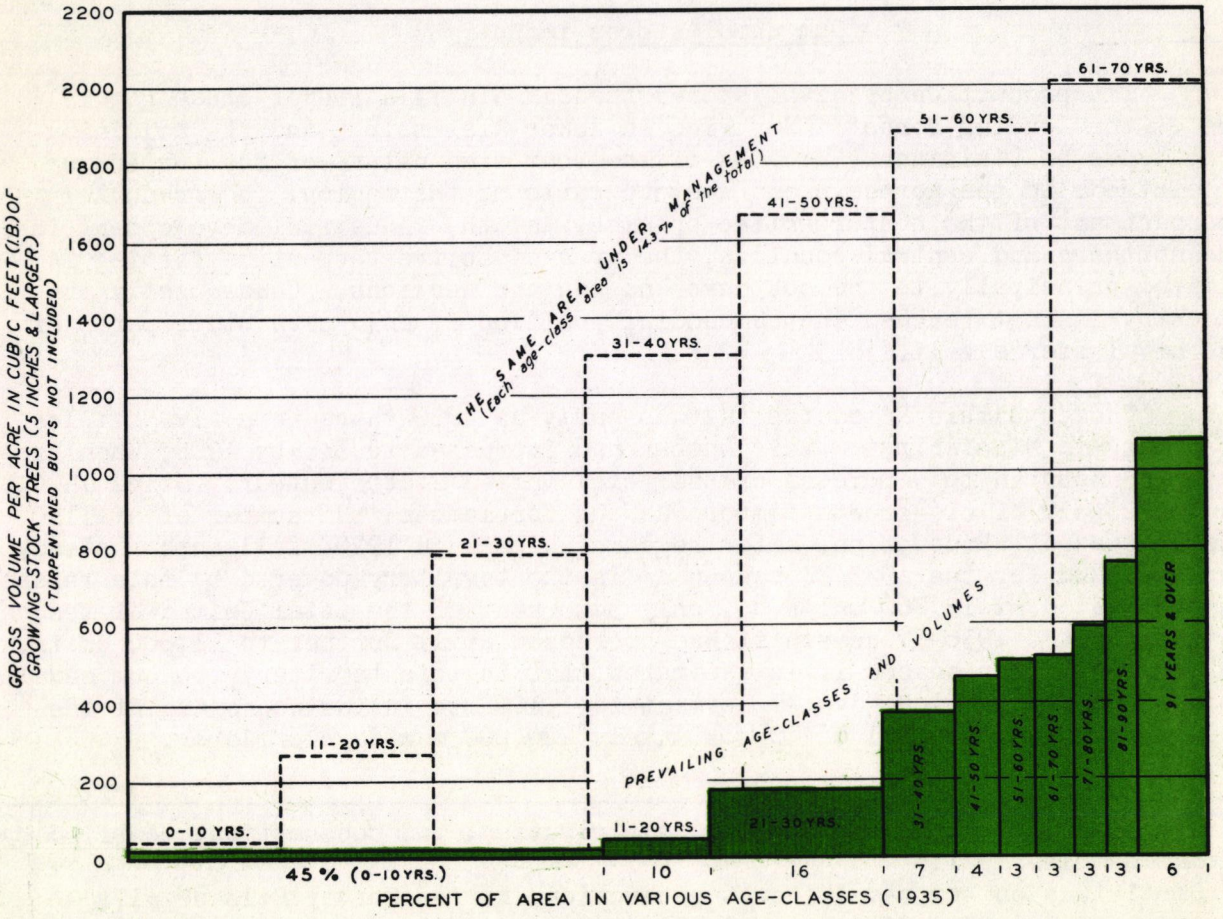

FIGURE 3 — PREVAILING AGE-CLASS AND VOLUME DISTRIBUTION COMPARED WITH THAT ON THE SAME AREA UNDER MANAGEMENT (BASED ON TURPENTINE-PINE TYPE AREA OF 3,409,100 ACRES)

The present forest differs from the theoretical one in at least two major respects. First, the distribution of age-classes by area is irregular and faulty; there is an area deficiency in each of the age-classes older than 30 years, and the prevailing 0- to 10-year age-class occupies 45 percent of the area, whereas in the managed forest this age-class is limited to 14 percent. The second outstanding difference is the obvious under-stocking in all age-classes of the present forest; on the average, the total volume per age-class appears to be considerably less than a third of what it might be.

Approximately 31 percent of the pine forest sites in these Survey units are classed as good, growing trees 75 feet or higher in 50 years; 68 percent of the sites are medium, as indicated by 60- and 70-foot trees; and only 1 percent of the sites are poor, growing trees which attain a height of less than 55 feet in 50 years.

Naval Stores Aspects

The turpentine, rosin, and other naval stores manufactured in this area are produced by three distinct industries: wood-distillation plants, pulp mills, and gum-turpentine stills. In 1936 their combined output amounted to 290,000 barrels of rosin and 56,000 barrels of turpentine, of which the gum stills produced 13 and 21 percent, respectively.

Gum naval stores industry

The production of naval stores through distillation of crude gum is one of the leading forest industries in lower Mississippi and the adjoining pine lands of Louisiana. Because of the scattered nature of the turpentine pine stands in the northern and western parts of the region, the gradual encroachment of the nonturpentine species, and the industrial development in the northern and central counties, the area of active turpentine farming is limited principally to the southern and eastern sections. Consequently the industry has not reached the commanding position it enjoys in other parts of the naval stores belt.

Thomas Gamble 6/ states that as early as 1850 there were five stills operating in Mississippi. This number had increased to 145 by 1900, when production amounted to 9 percent of the total United States output. Since 1900, as the supply of old-growth timber was cut for lumber, the number of stills has decreased. Production, after reaching a peak in 1920, fell into a steady decline, and for the 1933-34 season 7/ in the territory covered by this report was estimated at 13,700 units 8/, only 3 percent of the total United States output; in the 1936-37 season it had decreased still further to 11,600 units. During the latter season it is estimated that in this territory the gum naval stores industry, which gave employment to 1,100 men in the woods and at the stills, provided a total of approximately 220,000 man-days of labor.

6/ Naval stores history production, distribution, and consumption, compiled by Thomas Gamble, 1921.
7/ Statistics on gum naval stores production, Forest Survey Release #17, Southern Forest Exp. Sta. Dec. 31, 1935.
8/ A naval stores unit is equivalent to one 50-gallon barrel of turpentine and three and one-third 500-lb. (gross) barrels of rosin.

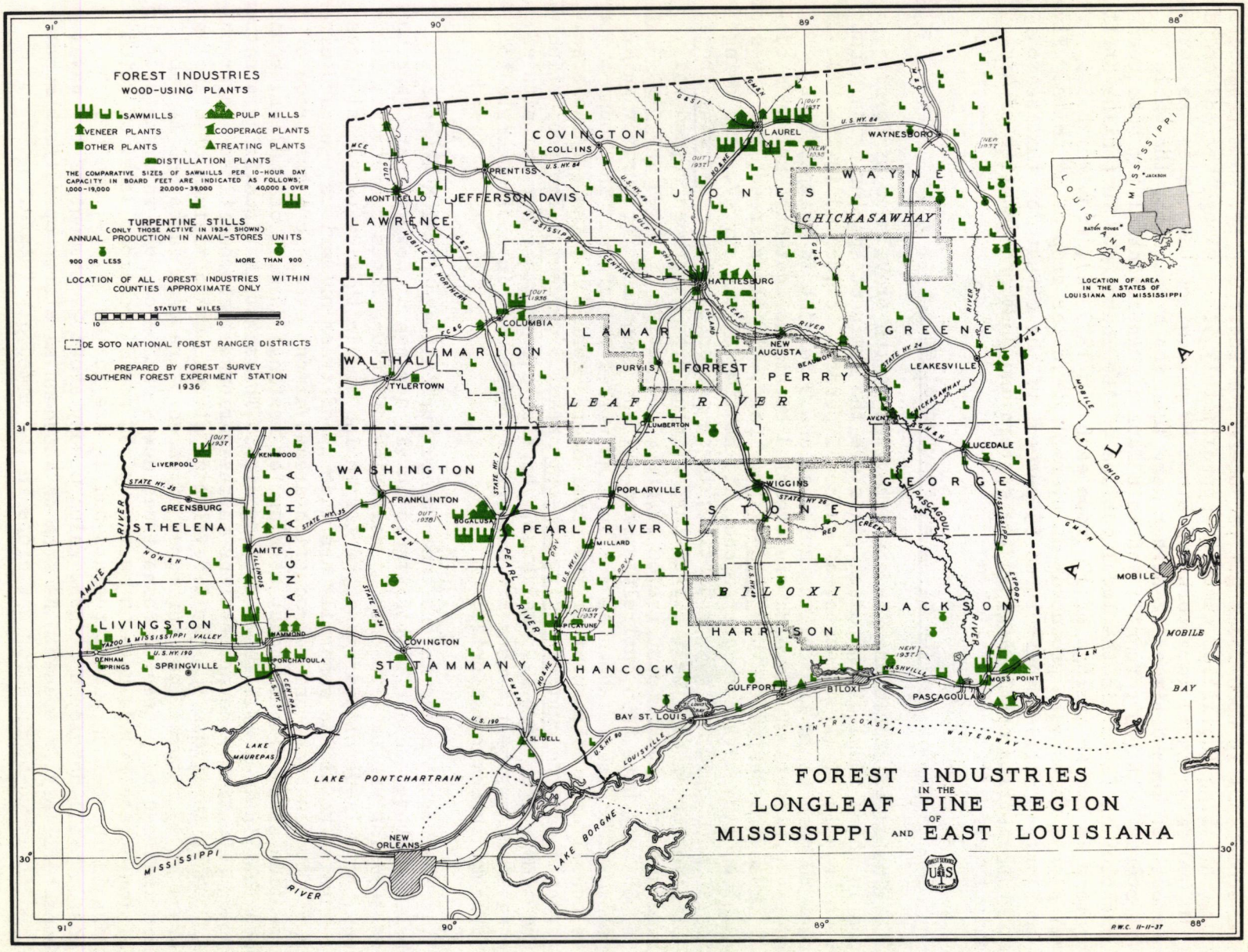

FIGURE 4 – FOREST INDUSTRIES MAP.

There were 22 stills operating in this area during the 1934-35 season, when the last complete count was made. Two of these had no woods operation but depended solely upon local gum producers for their supply. Gum producers without stilling facilities numbered approximately 510. Altogether 388 crops (of 10,000 faces each) were worked. Since 80 percent of the timber was leased, the amount of leased timber is higher here than the average for the whole naval stores belt (73 percent); and this lack of owner-control may have been a contributing factor in the local decline of the industry. Turpentine-still operators worked an average of 13 crops each (in 1933-34), from which 563 naval stores units were produced—an average yield per crop of 43 units. Five of the largest stills manufactured 53 percent of the output for that season. Most of the stills are located in the eastern and southern counties of Mississippi (fig. 4).

The naval stores forest area

The naval stores area is characterized by the prevalence of forest types in which longleaf and slash pines are the dominant species. The gross forest area is 3,711,600 acres, of which 11 percent is located in the flatwoods, 80 percent in the rolling uplands, and 9 percent in swamps, bays, ponds, etc. Parts of the area are occupied by stands that have not been cupped; these are designated as round-timber areas. In other areas, the trees of turpentine size have been cupped and, at the time of the survey, were being chipped and dipped for gum production; these are designated as working areas. In still other areas, the trees of turpentining size have been cupped and worked and are either being rested before a new series of faces are placed on them, or they have been entirely worked-out and abandoned for further naval stores use; these are known as resting and worked-out areas. The round-timber area constitutes 85 percent of the naval stores territory; the working area, 6 percent; and the resting and worked-out areas, 9 percent. The proportion of round-timber area here is considerably higher than in other Survey units of the naval stores belt, where it ranges from 19 percent in south Georgia to 79 percent in central Florida.

The forest areas in the three broad turpentine condition-classes described above contain timber stands in all degrees of development, ranging from seedling areas, with only a scattering of future faces on residual large trees, to well-developed stands of turpentine size with many potential faces per acre. The stands generally are made up of trees of various ages and sizes. Except for clear-cut and reproduction areas, almost every acre has trees of turpentine size (either round, working, or resting) as well as smaller, round trees that in time will reach cupping size. To assist in visualizing a rather complex situation, the proportions in the various stand-conditions are graphically shown in figure 5. "Well-developed" stands have a minimum of 8 and an average of 19 future faces per acre, of which 5 are back faces and 14 are faces that can be placed on round trees now 9 inches or more in diameter. In addition, these stands have an average of 54 round trees per acre, of which 10 are in the 8-inch diameter-class and 44 are in the 2-, 4-, and 6-inch classes. Well-developed stands, which occupy about 22 percent of the naval stores territory, represent the area on which naval stores operations must depend in large measure for new crops in the immediate future.

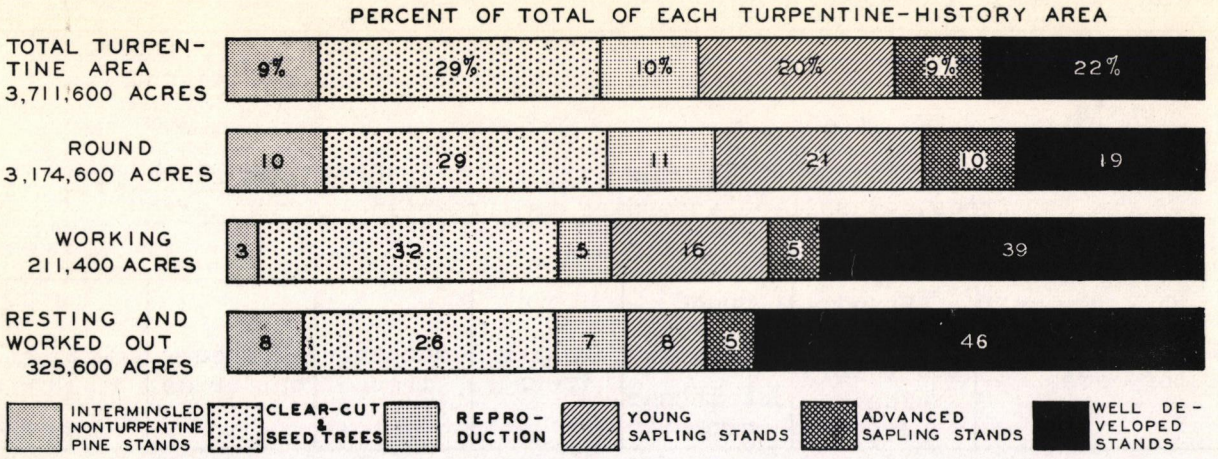

FIGURE 5 — CONDITION OF THE TURPENTINE AREA

"Advanced sapling" stands are in a younger age-class than the well-developed stands. The stand averages 76 round trees per acre, of which 2 are in the 10-inch diameter-class, 12 in the 8-inch class, and 62 are in the 2-, 4-, and 6-inch classes. Such stands occupy 9 percent of the turpentine area and constitute, in the main, areas that will be ready for intensive turpentining in 8 to 15 years.

"Young sapling" stands average 87 round longleaf and slash pine trees, all in the 2-, 4-, and 6-inch diameter-classes. These young stands occupy 20 percent of the forest area in the naval stores territory. With reasonable protection from fire, and if not first cut for pulpwood, many of these trees should attain workable size for naval stores operations in 15 to 20 years.

"Reproduction" areas have established seedling stands of longleaf and slash pine. The "clear-cut and seed-tree" area had at the time of the survey no established stands of seedlings and occupied 29 percent of the naval stores forest area. With effective and continuous protection from fire, within 30 years a large part of the area in these two classes should develop stands of turpentine pines to carry the load in the cycle of naval stores operations. A part of the clear-cut area may have to be planted if it is to reach operable size within the time limit indicated. Intermingled in the turpentine forest, in patches and "stringers," are areas occupied by loblolly pine, hardwoods, or other nonturpentine forest types, which at present occupy about 9 percent of the turpentine-forest area. These areas, which cannot be considered as an asset in naval stores operations, probably will increase in extent.

At the time of the field inventory an estimate was made of the total number of slash and longleaf pine trees 2 inches in diameter and larger in the naval stores forest area. Table 3 is a statement of this inventory, in which the trees are shown as round, working, resting, or worked out. The inventory is further broken down by areas classified as round, working, and resting and worked out. The outstanding fact disclosed by this inventory is that for every tree being worked for turpentine in 1934 there were 50 round trees 2 inches d.b.h. and larger serving as a possible resource for future turpentine operations. Even with a heavy discount for losses due to fire, wind, and insects, and for trees prematurely cut for pulpwood, there would

seem to be ample justification for the belief that these two Survey units might easily support a much larger naval stores industry on a continuous-supply basis.

Table 3. - Round, working, resting, and worked-out longleaf and slash pine trees, classified according to turpentine-history area

Turpentine-history area	Round trees 1.0 to 8.9 inches d.b.h.	Round trees at least 9.0 inches d.b.h.	Working trees	Resting trees	Worked-out trees	Total
			Thousand trees			
Round-timber area	115,671	12,545	-	319	47	128,582
Working area:						
Front faced	6,013	237	2,048	22	52	8,372
Back faced	3,650	27	925	40	28	4,670
Resting and worked-out areas	9,635	987	-	2,312	1,242	14,176
Total	134,969	13,796	2,973	2,693	1,369	155,800

The future naval stores timber supply

In the effort to approach the matter of a future supply from a more realistic angle than that involved in considering only the number of round trees regardless of their location or stand density, an analysis has been made that involves consideration of (1) the number of potential or future faces now in well-developed stands, (2) the future faces that may be reasonably expected from the areas now in the advanced sapling stage, and (3) the faces to come in at a still later period from stands now in the young sapling areas. In this approach, it is assumed that the well-developed stands will be exploited in the working period 1935-1942. At the end of this period, the advanced sapling stands, which will begin to reach operable size and density, together with the back-faces on previously worked timber, will produce the supply of working faces for the period 1943-1950. The third cycle of naval stores operations, beginning in 1951, would depend upon trees now in the young sapling stage of development, supplemented by back-faces on previously worked timber. A basic assumption is that all of the trees will be worked for naval stores when they reach 9 inches d.b.h., and that after being worked on the front side they will be back-faced. Natural mortality and prevailing growth behavior have been taken into account.

On these assumptions, the analysis shows that during the first 8-year working period (1935-1942) the stands on the well-developed areas should produce sufficient round trees to allow the hanging of 1.8 million new cups each year and, in addition, to permit the hanging of cups each year on approximately a half million new back-faces. An annual replacement possibility of this size would maintain a working body of turpentine crops over $2\frac{1}{2}$ times the average working body maintained between 1932 and 1936.

In the second 8-year working period (1943-1950), the analysis indicates that the annual supply of both round trees and back-faces on previously worked trees would allow the hanging of approximately 2½ million new cups annually. In the third 8-year period, the annual income of new trees and new back-faces would be still greater, allowing a further increase in the size of the naval stores industry in the two Survey units.

As stated before, these calculations are based upon the use of a minimum 9-inch diameter limit for cupping; if the practice of past years of cupping approximately one-third of the trees in the 8-inch class should prevail, the indicated income of new faces would be about 20 percent greater.

In all of the above considerations, it is assumed that the trees will not be cut before they have been completely worked out for naval stores, and that all of the potential faces will be used when the trees reach turpentining size. Table 4 indicates that although during 1934, 1935, and 1936 the number of round trees cut for wood products exceeded that of the newly turpentined trees, there was a slight increase in the number of round trees 7.0 inches d.b.h. and larger and an appreciable increase in the number 9.0 inches and larger. The growing demand for pulpwood to feed the mills in and near this territory may reduce materially the supply of round longleaf and slash pine trees for turpentining through the simple process of removing them before they are large enough to be turpentined. Also, a considerable part of the naval stores area in these two units is included in the DeSoto National Forest, where the management policy may be to grow large, high-quality, sawlog trees, and to withhold or limit turpentining on a considerable proportion of the stands.

Another factor that may have a bearing on the future timber supply is the growing tendency on the part of many private timber owners to manage their forests for integrated wood products with naval stores either left out of the picture entirely or included only as byproducts. This may sharply reduce the amount of timber that would otherwise be available for maintaining turpentine operations. The outcome of the growing competition between lumbermen, pole and pile producers, pulpwood consumers, and naval stores men----all for the same timber——cannot be forecast, but there certainly is a sufficient number of growing trees in sight to maintain a much larger naval stores industry than at present, if that industry can get the use of the timber before it is felled for other purposes.

Table 4. - Net change in number of round trees 7 inches d.b.h. and larger and 9 inches d.b.h. and larger between Jan. 1, 1934, and Dec. 31, 1936

Item	1934		1935		1936	
	7 inches and larger	9 inches and larger	7 inches and larger	9 inches and larger	7 inches and larger	9 inches and larger
	Thousand trees					
Round trees as of Jan. 1	26,734	13,494	26,733	13,796	27,264	14,601
Increase due to growth of smaller trees	2,265	1,802	2,265	1,802	2,265	1,802
Decrease due to mortality	565	296	572	307	583	324
Net increase	1,700	1,506	1,693	1,495	1,682	1,478
Trees turpentined	725	502	398	227	380	217
Trees cut for products	976	702	764	463	1,283	882
Total industrial drain	1,701	1,204	1,162	690	1,663	1,099
Net change during year	-1	302	531	805	19	379
Round trees as of Dec. 31	26,733	13,796	27,264	14,601	27,283	14,980
Percent of number on Jan. 1, 1934	100.0	102.2	102.0	108.2	102.1	111.0

Wood naval stores industry and resources

The chief producers of turpentine and rosin in this region are the wood distillation plants rather than those of the gum naval stores. Using the steam and solvent process, the eight plants now in operation (1938) are reported to have a combined maximum daily utilization capacity of about 1,270 tons of stumps and topwood. These plants, which are well scattered throughout the best stumpland areas in this territory, represent the greatest concentration of these plants in the South (fig. 4). It is estimated that they provide about 600,000 man-days of labor in the woods and at the plants. Their potential annual production volume, assuming a 300-day year and operation at full capacity, is estimated to be 320,000 barrels of rosin, 50,000 barrels of turpentine, and 48,000 barrels of pine oil. Three new establishments and one rebuilt in 1936 have come into production in the last 2 years.

The five plants operating during 1934 consumed 217,000 tons of distillate wood in the ratio of 80 percent stumpwood to 20 percent topwood. Most of the stumpwood was blasted from the "stump fields" that resulted from clear-cutting virgin longleaf pine stands. Since second-growth stumps are not now acceptable and existing virgin stands are disappearing rapidly with no replacement in sight, this is probably the sole wood-using industry that is based upon "mining" of the resources.

Blasting is the common method of extraction employed in this section. Although yielding only 60 percent as much volume per acre as mechanical stump-pullers, blasting remains the more economical method here, owing to the low operating efficiency of the expensive pullers in hilly country and to the tenacious, clay subsoils, which make up the bulk of the merchantable stump land.

The area bearing accessible seasoned stumps in 1935 totaled about 1,500,000 acres, 88 percent of which was in the rolling uplands. Since profitable extraction depends largely upon the number of stumps per acre, the merchantable acreage is broken down into four density classes (table 5). Over 50 percent of this area averages 14 or more stumps per acre.

Table 5. - Present merchantable area of stump land, classified according to topographic situation and stumps per acre

Stumps per acre	Flatwoods	Rolling uplands	Swamps, bays, ponds, etc.	Total stump land	Percent of total stump land
			Acres		
5 or less	27,800	233,200	7,800	268,800	17.5
6 to 13	38,500	389,100	5,500	433,100	28.3
14 to 25	35,600	375,000	5,400	416,000	27.2
26 and over	51,300	357,400	4,600	413,300	27.0
Total stump land	153,200	1,354,700	23,300	1,531,200	100.0
Percent of total stump land	10.0	88.5	1.5	100.0	

The volume of seasoned stumpwood occurring on the merchantable area in 1935 is estimated to have been more than 5,700,000 tons (blasting basis). This aggregate tonnage is classified in table 6 according to its topographic location and average number of stumps per acre. Of interest to the industry is the fact that 83 percent of the tonnage occurs on areas where stumps average 14 or more per acre.

In addition to the present merchantable acreage, there are extensive areas of seasoned stumps that are considered inoperable under present standards because of surrounding dense stands of second-growth timber or reproduction. These areas may eventually be "stumped" and should be considered as potential sources of future supply. Another such source is made up of freshly cut stumps from old-growth trees, which must season 10 to 15 years before they are suitable for distillation. Areas on which these two types of stumps occur total 1,880,000 acres. On the basis of extraction by blasting there are in this area over 5,700,000 tons (i.e., approximately the same as on the merchantable area), 79 percent of which occurs at an average rate of 14 or more stumps per acre. Finally, there is the unestimated supply to be obtained when old-growth timber now standing is felled and its stumps are seasoned and utilized.

In addition to the stumpwood supply, there is a considerable (but unestimated) tonnage of "topwood" derived from the seasoned heartwood of dead longleaf pine trees both standing and down. Assuming that a full use is made of the stumpwood and topwood on areas classified as "accessible" and that the potential supply in less favorable situations will be used as this supply is exhausted, it would seem possible for the present distillation plants to operate for at least 30 years at three-fourths of their maximum capacity. The slow but certain attrition of fire and rot, however, and the use of stumps for fuel wood will tend to shorten the life of the operations.

Table 6. - Present merchantable stump volume classified by topographic situation and stumps per acre (blasting basis)

Stumps per acre	Flatwoods	Rolling uplands	Swamps, bays, ponds, etc.	Total stump volume	Percent of total stump volume
	- - - - -	Thousand tons	- - - - - -		
5 or less	11	94	3	108	1.9
6 to 13	77	778	11	866	15.1
14 to 25	143	1,499	22	1,664	29.0
26 and over	385	2,681	34	3,100	54.0
Total stump volume	616	5,052	70	5,738	100.0
Percent of total stump volume	10.7	88.1	1.2	100.0	

Volume Estimates

Board-foot volume

In the estimates given in table 7, the volume of sound sawlog-size trees is expressed in terms of board feet, as measured by the Doyle log rule. The volumes are net log scale, that is, allowance has been made for material that would be left in the woods because of rot, fire scar, crook, limbiness, and similar defects, as well as for loss in sawing at the mill due to sweep and hidden defects. Volume was included to the upper limit of usable material in the tops rather than to a fixed top-diameter, but neither pine logs less than 5.5 inches in diameter inside bark at the small end nor hardwood logs less than 8.5 inches, were included. The trees in the volume estimate must contain at least one sound butt log, or 50 percent of the gross volume of the tree must be sound material. In addition, hardwoods must be at least 13.0 inches d.b.h. outside bark, and pines and cypress 9.0 inches. Only the usable portion of turpentine butts is included in inventory figures.

Table 7. - Net board-foot volume (Doyle) by major species-groups and forest conditions 1/, 1935

Species-group	Old growth		Second growth		Total	Percent of total volume
	Uncut	Partly cut	Sawlog size	Under sawlog size 2/		
	Thousand board feet					
Pines:						
Longleaf	23,700	299,400	222,000	113,100	658,200	9.9
Slash	402,900	95,600	201,100	29,300	728,900	11.0
Loblolly	89,600	117,100	1,461,200	82,000	1,749,900	26.4
Others	70,400	70,200	321,900	24,200	486,700	7.3
Total	586,600	582,300	2,206,200	248,600	3,623,700	54.6
Hardwoods:						
Red gum	213,600	159,100	214,000	28,800	615,500	9.3
Black gum	353,900	263,900	215,200	26,900	859,900	12.9
Other pulping 3/	110,300	148,900	173,400	13,800	446,400	6.7
Red oaks	91,900	191,300	143,200	41,900	468,300	7.0
White oaks	39,800	66,700	56,000	13,900	176,400	2.7
Other nonpulping 4/	65,600	121,400	77,200	20,300	284,500	4.3
Total	875,100	951,300	879,000	145,600	2,851,000	42.9
Cypress	102,100	38,600	20,700	5,700	167,100	2.5
Total all species	1,563,800	1,572,200	3,105,900	399,900	6,641,800	100.0
Percent of total	23.5	23.7	46.8	6.0	100.0	

1/ Includes usable butt sections of turpentined trees.
2/ Includes volume in reproduction and clear-cut conditions.
3/ Bay, yellow poplar, etc.
4/ Hickory, ash, beech, etc.

All board-foot volume shown in tables 7 and 8 is accessible. Favorable logging conditions, light logging equipment, trucks, adequate road systems, and the portability of the present sawmills generally bring even the most isolated stands within reach of the mill operator. The availability of this volume, however, depends upon a number of variable factors, chief of which are ownership, quality, stand per acre, and the working status of the turpentine timber.

In figure 6 is given an analysis of the saw-timber stands of the turpentine pine types to illustrate the relative prevalence of areas with certain board-foot volumes per acre. The outstanding features brought out by the chart are (1) that a relatively large proportion (54 percent) of the area in sawlog-size turpentine pine types bears less than 2,000 board feet per acre, and (2) that nearly 50 percent of the saw-timber volume in these types occurs in stands

of 5,000 or more board feet per acre. If it is assumed that an area must bear 2,000 feet per acre or more to be available for utilization, principally lumber, then 46 percent of the forest area in the turpentine pine types falls in this class. Moreover, 79 percent of the total volume in these types was in areas bearing 2,000 feet per acre or more.

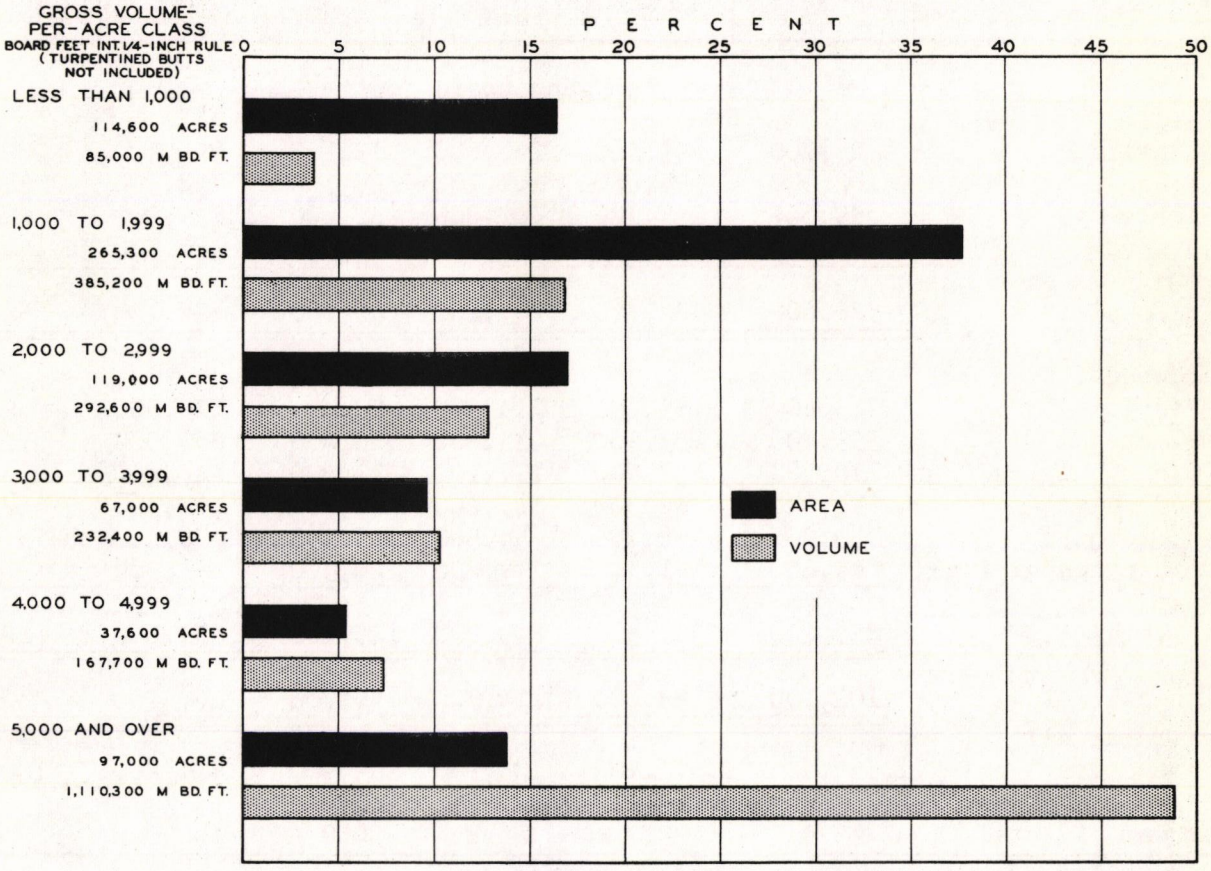

FIGURE 6 — PROPORTIONAL AREA AND VOLUME OF THE SAWLOG-SIZE CONDITIONS IN THE TURPENTINE PINE TYPES, CLASSIFIED ACCORDING TO VOLUME OF SAWTIMBER PER ACRE.

Since the naval stores industry ordinarily makes much use of longleaf and slash pines, especially in the southern portion of the territory, a delay of 6 to 14 years for the turpentining cycle should be anticipated after stands of these trees reach sawlog size before complete utilization may be realized.

Timber estimating and purchase of logs in the South has been based until recently almost entirely upon the Doyle log rule. Although it is the legal rule for Mississippi and Louisiana, in stands composed predominantly of small trees, which are typical of this forest area, the use of the Doyle rule results in greatly underestimating the actual recoverable volume. An estimate that closely approximates green lumber tally has been derived by the use of the International $\frac{1}{4}$-inch rule; it appears in table 8.

Table 8. - Net board-foot volume, classified according to species-group and forest condition (International $\frac{1}{4}$-inch rule), 1935

Species-group	Old growth		Second growth		Total
	Uncut	Partly cut	Sawlog size	Under sawlog size 1/	
	Thousand board feet				
Pines	833,000	913,900	3,850,700	534,500	6,132,100
Red and black gum, bay, cypress, etc.	1,026,100	873,600	934,300	121,100	2,955,100
Red and white oak, hickory, etc.	249,500	487,500	393,000	114,000	1,244,000
Total	2,108,600	2,275,000	5,178,000	769,600	10,331,200

1/ Includes volume in reproduction and clear-cut conditions.

Cordwood volumes

A large portion of the wood volume taken from the forest each year is used in the form of cordwood. Table 9 shows the sound volume of the entire stand of trees 5.0 inches or more d.b.h., outside bark, expressed in standard (4 x 4 x 8 ft.) cords, woods cull deducted. Briefly, this is supplied from the following sources:

1. From the merchantable stems of sawlog-size trees.
2. From that portion of saw-timber trees not used as sawlogs but usable as cordwood. This includes the upper stems of all species to a variable top-diameter limit (but not less than 4 inches), the limbs of hardwoods and cypress to a 4-inch minimum, and unusable portions of turpentined butts.
3. From sound trees under sawlog size at least 5.0 inches d.b.h., in which the entire stem of all species is included to a variable top-diameter (but not less than 4 inches).
4. From the estimated sound material in sound and rotten cull trees.

Deductions for cull include only defects which cause the material to be unsuited for use as cordwood. Sweep and slight crook, therefore, are not deducted.

Table 9. - Net volume of all sound material, including bark, expressed in standard cords

Species-group	Source of material				Total all sources	Percent of total
	Sound trees saw-log size	Tops of sawlog-size trees	Sound trees under saw-log size	Cull trees		
	Cords					
Turpentine pines:						
Worked	1,909,700	386,500	204,200	7,700	2,508,100	4.3
Unworked	3,331,900	651,100	1,820,700	39,300	5,843,000	9.9
Nonturpentine pines	8,518,300	1,494,100	3,398,700	537,100	13,948,200	23.8
Total pines	13,759,900	2,531,700	5,423,600	584,100	22,299,300	38.0
Hardwoods:						
Pulping 1/	7,401,900	3,770,000	8,039,700	4,827,100	24,038,700	40.9
Nonpulping	3,037,300	1,714,900	4,003,300	3,656,300	12,411,800	21.1
Total hardwoods	10,439,200	5,484,900	12,043,000	8,483,400	36,450,500	62.0
Total all species	24,199,100	8,016,600	17,466,600	9,067,500	58,749,800	100.0
Percent of total	41.2	13.6	29.8	15.4	100.0	

1/ Includes cypress.

There is no question concerning the physical accessibility of the area upon which this volume occurs. Economic availability, however, is another question, which depends upon much the same factors as the profitable logging of saw timber. In general, the smaller the average size of trees and the lower the quality acceptable, the greater is the quantity of material available. The chart (fig. 7) shows at a glance the relative volumes (exclusive of that in cull trees) distributed among the broad species-groups and diameter-classes. The relatively large volume in pulping hardwoods reflects the opportunities for more intensive use of these species, especially the under-sawlog-size material.

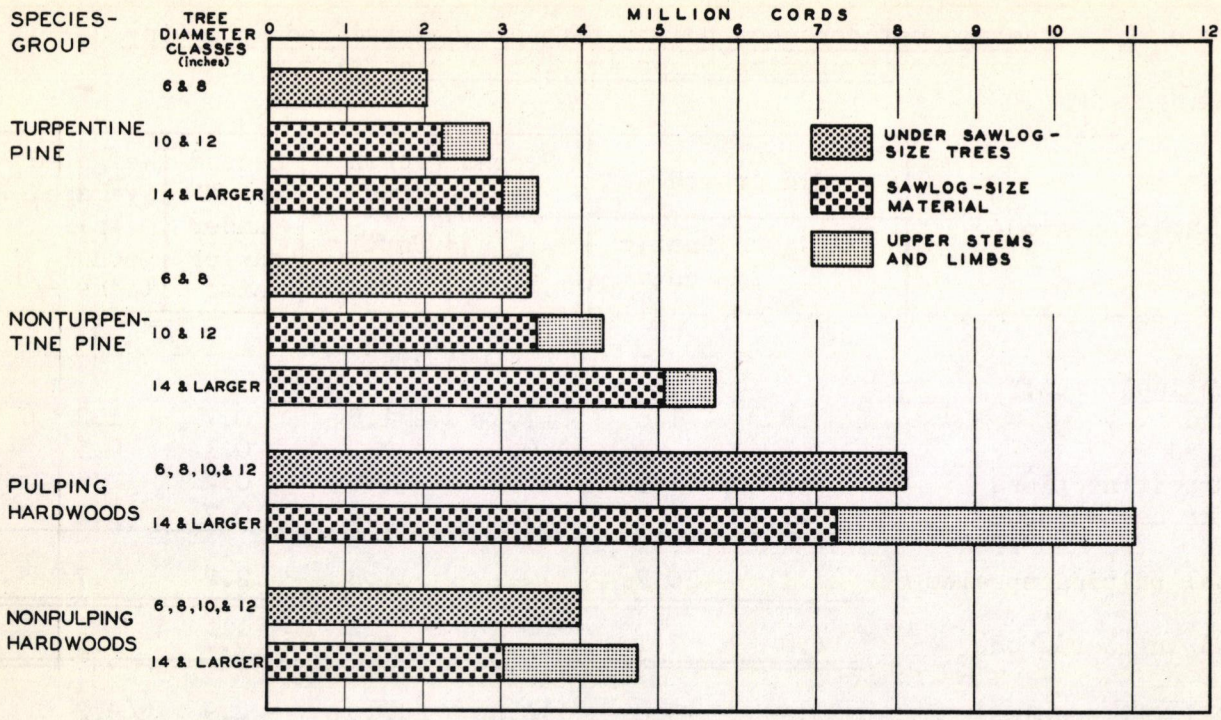

FIGURE 7— TOTAL CORDWOOD VOLUME IN SOUND TREES BY SPECIES-AND DIAMETER-GROUPS AND BY SOURCE OF MATERIAL

Two important factors limiting the immediate use of some of the pulpwood timber are (1) prior use for naval stores, and (2) low average stand (in cords) per acre. Turpentine pines make up 14 percent of the total cordwood volume. Some of this occurs in the northern part of the area, where there are no naval stores operations, and it will not be affected; but on approximately 6 million cords in the southern part, the claim of the naval stores industry currently operates to delay the harvest, retard growth, and lower slightly the quality and volumes per acre recoverable.

The average number of cords per acre[9/] in the several forest conditions and species-groups is a further index to the availability of these volumes. This is shown in table 10 and indicates what may be expected over large areas in similar types and conditions.

9/ Volumes on average acres in the principal units of the naval stores region, Forest Survey Release No. 29, Oct. 30, 1937, Southern Forest Exp. Sta., New Orleans, La.

Table 10. - Average net cordwood volume per acre, classified according to species-group and forest condition

Species-group	Old growth		Second growth sawlog size		Second-growth under sawlog size	Weighted average, all conditions 1/
	Uncut	Partly cut	Uncut	Partly cut		
	Cords per acre 2/					
Turpentine pines:						
Round	2.8	1.6	1.5	1.8	0.7	1.2
Worked	3.2	1.1	0.5	0.7	0.1	0.5
Nonturpentine pines	2.5	1.5	6.9	4.8	0.7	2.8
Pulping hardwoods 3/	15.9	6.5	4.2	3.5	0.7	3.2
Total pulping species	24.4	10.7	13.1	10.8	2.2	7.7
Nonpulping hardwoods	4.0	3.1	1.7	1.7	0.7	1.5
Total all species	28.4	13.8	14.8	12.5	2.9	4/ 9.2

1/ Does not include areas in reproduction or clear-cut condition.
2/ Excludes upper stems and limbs of hardwoods, and cull trees.
3/ Includes cypress.
4/ The weighted average for all species and all conditions, including reproduction and clear-cut areas, is 6.9 cords per acre.

Pine poles and piles

Included in the tables and charts of cordwood and saw-timber volume are many pine trees suitable for poles and piles. These especially qualified trees may be found as scattered individuals throughout the area, but are most common in the old-growth and sawlog-size second-growth pine stands in the northern and central counties of Mississippi. The Survey made a conservative estimate of their number, placing them in length- and diameter-classes (table 11). With approximately 320 wood-using plants in this area, other than treating plants, it is evident that pole buyers must meet a strong competition for their material, but the premium price they are able to offer encourages sellers to seek the better market.

Table 11. - Total number of poles and piles, classified according to length and diameter, 1935

Diameter-class (outside bark)	Pole or pile length (feet)						Total	Percent of total sticks
	20	25	30	35	40 and 45	50+		
Inches	Thousand sticks							
8	3,638	693	188	-	-	-	4,519	30.6
10	2,326	1,055	731	255	120	-	4,487	30.3
12	1,113	784	681	353	235	37	3,203	21.7
14	361	413	362	241	203	59	1,639	11.1
16	83	176	163	106	137	54	719	4.9
18	6	52	43	38	49	26	214	1.4
Total	7,527	3,173	2,168	993	744	176	14,781	100.0
Percent of total	50.9	21.5	14.7	6.7	5.0	1.2	100.0	

Forest Increment

Forest increment as used in this release means the difference between the net volume of good trees standing on the area at the beginning of the year and that at the end, before deducting the total commodity drain for the year. If the loss in volume during the year due to mortality, rot, or injury is equivalent to the increase due to growth, there will be no increment; and if these losses are greater than the increase due to growth, there will be a reduction in the growing stock, in addition to that caused by commodity drain.

Board-foot increment is made up of the growth on sawlog-size trees and the total board-foot volume of trees becoming sawlog size during the year. Cordwood increment represents growth on the sound stemwood of pines 5.0 inches d.b.h. and over, on under-sawlog-size hardwoods, and on the sawlog portion of hardwoods 13.0 inches d.b.h. and larger. Included also is the total volume in pine and hardwoods that become 5.0 inches or larger during the year. In calculating both the board-foot and cordwood increment, cull material and cull trees are excluded.

In order to arrive at an estimate of average increments for various conditions uninfluenced by cutting, the data in table 12 were assembled. These figures are intended only as a basis for comparison with other forest regions and cannot be applied accurately to individual tracts of timber; they represent the average increment that occurred on live trees standing on the area at the beginning of the year, deduction having been made only for mortality. In 1935, the increment in the second-growth sawlog-size condition throughout the area averaged 263 board feet per acre, while that in the reproduction and clear-cut conditions averaged only 6. For the entire forest area, the average increment per acre was 105 board feet. Cordwood increment averaged 0.4 cord per acre for all types and conditions.

Table 12. - Average increment per acre on the forest area, classified according to forest condition, 1935

Forest condition	Saw-timber material			All material		
	Pine	Hard-wood 1/	Total	Pine	Hard-wood 1/	Total
	Board feet 2/			Cords 3/		
Old growth	28	104	132	.09	.39	.48
Second growth:						
Sawlog size	211	52	263	.56	.30	.86
Under sawlog size	54	10	64	.25	.13	.38
Reproduction and clear-cut	6	negl.	6	.02	.02	.04
Weighted average	75	30	105	.24	.18	.42

1/ Includes cypress.
2/ International $\frac{1}{4}$-inch scale.
3/ Outside bark.

In table 13, the total increments (in board feet and cords) which occurred during 1935 in the three major species-groups are listed by forest conditions. In these calculations allowance has been made for the effect of cutting. It may be estimated roughly that in 1935 turpentining was responsible for a loss of over 40 million board feet. Most of this was due to the increased mortality and the difference between the growth of the turpentined trees and the growth they would have made had they been left round. A small part was caused by the degrading of material in turpentined butts.

Table 13. - Total net increment classified according to forest condition and species-group, expressed in board feet 1/ and standard cords, 1935

Forest condition	Longleaf and slash pine		Loblolly, shortleaf, and other pine		Hardwood and cypress		Total all species-groups	
	M board feet	Cords	M board feet	Cords	M board feet	Cords	M board feet	Cords
Old growth	-400	-5,300	18,600	65,100	83,900	317,800	102,100	377,600
Second growth:								
Sawlog size	60,700	157,900	260,300	692,700	77,700	466,800	398,700	1,317,400
Under sawlog size	58,100	264,700	69,700	335,800	23,300	309,400	151,100	909,900
Reproduction and clear-cut	6,800	21,200	2,500	5,800	500	31,400	9,800	58,400
Total	125,200	438,500	351,100	1,099,400	185,400	1,125,400	661,700	2,663,300

1/ International $\frac{1}{4}$-inch scale.

Wood-Products Industries and Employment

The manufacture of lumber, veneer, cooperage, pulp, and miscellaneous forest products constitutes the major industry in this region. Almost every community has a mill or a concentration yard for lumber, cross ties, or poles (see industry map, fig. 4), and the larger inland cities have grown up around the sawmill industry. But conditions are changing. During the last few years several of the largest sawmills have ceased operation and more will cut out shortly, owing to the lack of adequate supplies of virgin timber. In contrast, the smaller mills are increasing in number.

The major production item, of course, is lumber, about 628 million board feet of which was produced by sawmills in 1936; 500 million of this was pine, 110 million hardwood, and 18 million cypress. Table 14 lists the number of sawmills operating in 1936 by capacity and species cut, together with the number of man-days of employment provided by them within the area.

Table 14. - Number of sawmills and man-days of employment, classified according to capacity of mill, 1936

Rated capacity (10-hour day) 1/	Mills 2/			Employment provided		
	Pine	Hardwood 3/	Total	Woods	Mill	Total
Thousand board feet	Number			Thousand man-days		
Under 20	268	-	268	148	249	397
20 to 39	10	1	11	62	88	150
40 to 79	2	3	5	61	88	149
80 and over	6	3	9	357	907	1,264
Total	286	7	293	628	1,332	1,960

1/ Rated capacity indicates size of mill rather than actual average production.
2/ Based on field survey in May 1937.
3/ Includes cypress.

Non-lumber industries

Scattered throughout the area and competing for the same timber are pulp mills, veneer mills, cooperage plants, and a number of other plants turning out such miscellaneous products as shuttle blocks, furniture squares, and paper-roll plugs. These accounted for approximately 20 percent of the wood products manufactured from material cut within the area in 1936. Moreover, these mills provided 31 percent of the man-days of labor required to cut and manufacture all woods products.

Although no manufacturing plants are required to produce cross ties, poles, piles, fuel wood, fence posts, etc., these are important activities, particularly in the rural sections, where they supply much of the part-time employment to farmers and other residents. Their wood consumption amounted to about 20 percent of the total of all wood-using industries. In this non-plant classification, the production of fuel wood ranks highest, both in volume production and in man-days of labor involved.

Treating plants, which are fixed consumers of premium-quality timber and cross ties, provided 47,000 man-days of plant labor in 1936.

Table 15 summarizes the employment data for the commercial forest industries and for other wood-producing activities. Under "units produced" is given the total volume (mill scale) that was manufactured in the area from forests both inside and outside the area. "Woods employment" includes all labor required to produce all the volume cut in the area. "Plant employment" includes all labor required in the forest-industrial plants to produce the given volumes.

Table 15. - Production and employment in the wood-products industries, 1936

Industry or commodity	Number of plants	Units produced	Thousand man-days (10 hours) of employment		
			Woods	Plant	Total
		M bd. ft.			
Lumber	293	627,900	628	1,332	1,960
Veneer	14	48,900	99	157	256
		Pieces			
Cross ties	-	645,000	90	-	90
Fence posts	-	1,551,000	25	-	25
Poles and piles	-	300,000	49	-	49
		Cords			
Pulpwood	3	448,800	244	759	1,003
Cooperage	5	19,800	21	24	45
Fuel wood	-	767,200	833	-	833
Miscellaneous	7	7,800	7	12	19
		M cu. ft.			
Treating plants	6	3,320	-	47	47
Total	328		1,996	2,331	4,327

Commodity Drain

The total volume cut annually from the forests of this area, regardless of its destination or point of manufacture, together with the incidental woods waste in logging, constitutes the commodity drain. Table 16 lists the board-foot and cubic-foot drain by commodity and general species-groups. In the sawlog material, all commodity drain is expressed in terms of board feet for purposes of comparison.

Table 16. - Commodity drain from good trees expressed in board feet (International $\frac{1}{4}$-inch scale) and cubic feet, 1936

Commodity	Sawlog material				All material			
	Pine	Hardwood 1/	Total	Percent	Pine	Hardwood 1/	Total	Percent
	M bd. ft.				M cu. ft. (i.b.)			
Lumber	420,400	99,300	519,700	66	74,640	14,250	88,890	60
Veneer	6,000	51,500	57,500	7	1,020	7,360	8,380	6
Cooperage	1,100	11,900	13,000	2	210	1,710	1,920	1
Pulpwood	50,300	1,600	51,900	7	17,100	430	17,530	12
Fuel wood	44,200	34,500	78,700	10	10,570	5,650	16,220	11
Poles and piles	21,100	200	21,300	3	4,300	40	4,340	3
Cross ties	19,200	11,400	30,600	4	3,880	2,070	5,950	4
Miscellaneous 2/	5,600	5,900	11,500	1	2,350	1,570	3,920	3
All commodities	567,900	216,300	784,200	100	114,070	33,080	147,150	100

1/ Includes cypress.
2/ Includes material in fence posts, volume from land clearing, and wood for domestic farm use.

Comparison of Volume Increment and Commodity Drain

During the past 50 years the forests of the longleaf pine region in Mississippi and adjacent Louisiana have suffered severe over-cutting, and for many years each succeeding year saw the total standing volume progressively reduced. In recent years, however, this trend has reversed until in 1934 the increment, principally on the fast-growing second growth exceeded by 74 million board feet the volume cut during that year. In 1935 the cut increased, but the total increment was still sufficient to cause an increase in growing stock of approximately 12 million board feet. Again in 1936 the commodity drain increased, and that year the growing stock was reduced more than 102 million board feet, as shown in table 17, which gives the board-foot volume estimated to have been standing on Jan. 1 of each year from 1934 to 1937.

Table 17. - Changes in growing stock

Date	Saw-timber material			All growing stock 5.0 inches d.b.h. and larger
	Pine	Hardwood	Total	
	- Thousand bd.ft. (green lumber tally) -			Thousand cu.ft. (i.b.)
Jan. 1, 1934	6,101,200	4,156,100	10,257,300	3,032,780
Jan. 1, 1935	6,132,100	4,199,100	10,331,200	3,109,950
Jan. 1, 1936	6,145,700	4,197,500	10,343,200	3,175,790
Jan. 1, 1937	6,074,300	4,166,800	10,241,100	3,224,420

The comparison of increment and commodity drain for 1936 (table 18) shows the net change in growing stock that took place during that year and the factors responsible for it. The nonturpentine pine group alone shows an increase in the saw-timber growing stock. The decrease among the other species, however, is sufficient to cause a general decrease of more than 102 million board feet of saw timber (fig. 8). If the saw-timber material is combined with that unsuited for sawlogs, and expressed in cubic feet, there results an increase in the total growing stock of almost 49 million cubic feet.

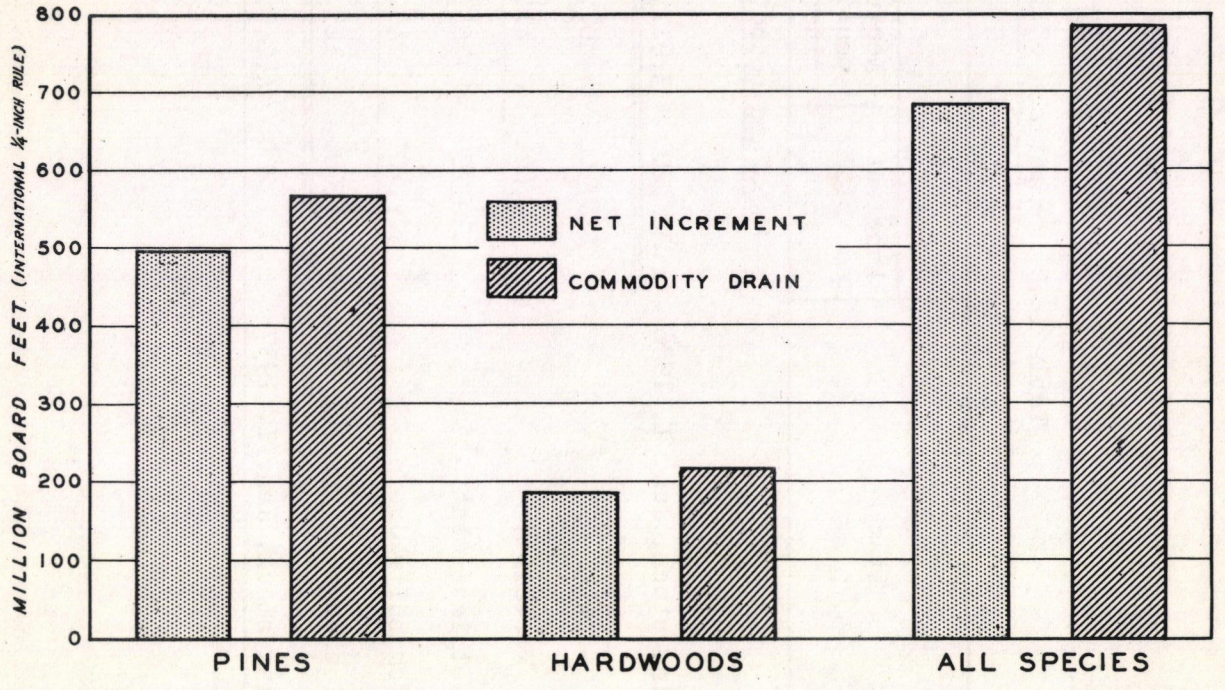

FIGURE 8 - COMPARISON OF NET INCREMENT WITH COMMODITY DRAIN, 1936.

Table 18. - Comparison of increment with commodity drain, 1936

Item	Saw-timber material					All growing stock 5 inches d.b.h. and over
	Longleaf and slash pines	Nontur-pentine pines	Total pines	Hardwood and cypress	All species-groups	
	---Thousand board feet (International $\frac{1}{4}$-inch rule)---					M cu. ft. (i.b.)
Growing stock, Jan. 1, 1936	2,228,200	3,917,500	6,145,700	4,197,500	10,343,200	3,175,790
Growth	170,300	407,400	577,700	212,200	789,900	226,370
Mortality	39,600	41,600	81,200	26,600	107,800	30,590
Net increment	130,700	365,800	496,500	185,600	682,100	195,780
Commodity drain	327,700	240,200	567,900	216,300	784,200	147,150
Net change in growing stock	-197,000	125,600	-71,400	-30,700	-102,100	48,630
Growing stock, Jan. 1, 1937	2,031,200	4,043,100	6,074,300	4,166,800	10,241,100	3,224,420

Summary and Outlook for the Future

This section of Mississippi and Louisiana, in which about 79 percent of the land area is forested, is adapted primarily to industrial-timber production. Well-developed forest industries established throughout the area take a leading role in its industrial activities and as a source of income and employment are second only to agriculture.

The forests of this area are passing through the closing years of a transition period. The acreage of old-growth timber is being replaced rapidly by second growth, but 73 percent of the forest area was classed in 1935 as second growth, 13 percent as old growth, and 14 percent as clear-cut.

Notwithstanding good forest soils and favorable growing conditions, understocking characterizes most of the forest area. In the turpentine pine types, which occupy 53 percent of the forest area, the prevailing average volumes per acre are less than a third of those attained on the areas bearing the best-stocked stands. Uncontrolled fire, disease, and the weakening effect of careless turpentining have added to the natural mortality, and in 1936 the total loss from these causes amounted to almost 108 million board feet in the sawlog material. Although natural conditions encourage rapid tree growth on practically all the forest area, the average increment per acre for the entire forest is only 105 board feet of saw timber.

The varied and well-developed forest industries present offer an excellent market for many types of wood products; 293 sawmills (25 of which have a capacity of 20 M board feet or more per day) produced almost 630 million board feet in 1936 and provided nearly 2 million man-days of employment. During 1936 and 1937, four of the largest sawmills cut their last logs, and one more large mill is scheduled to cut out in 1938. The 268 small portable mills, with capacities of less than 20 M board feet per day, cut only 19 percent of the lumber produced in 1936 and accounted for 20 percent of the total man-days of employment provided by the lumber industry. The 35 non-lumber plants, including pulp mills, veneer, cooperage, and treating plants, together with the producers of fuel wood, cross ties, and poles, used 40 percent of the volume cut from the forests of the area and accounted for 55 percent of the labor provided by all wood-using industries.

Turpentine and rosin is produced principally by the 8 wood distillation plants operating in this territory. These plants now operate on the principle of mining (i.e., the removal of an irreplaceable resource), although they may extend their life indefinitely by purchasing crude gum from producers without stills, a practice already started. Gum turpentine stills, which numbered 22 in 1934, produced about 21 percent of the turpentine and 13 percent of the rosin manufactured in this territory during the 1936-37 season. They provided about 220,000 man-days of employment.

The forest situation as it was at the close of 1936 is epitomised in the comparison of growth and drain: The saw-timber growing stock was reduced more than 102 million board feet, while the total growing stock on trees 5 inches d.b.h. and over increased approximately 49 million cubic feet.

The facts outlined above point toward the obvious conclusion that the wood-using industries are consuming the high-quality timber much faster than it is being replaced through growth. To continue in this direction can lead only to serious curtailments among the larger wood-using industries, increased unemployment, and a progressive depreciation of timber values.

Of prime importance, therefore, is the immediate inauguration of an intensive, organized effort to develop more fully the forest resources. Natural soil and climatic conditions favor excellent tree growth, and if the full potentialities of the forest are developed, it is probable that annual increment and volume per acre could be double or triple that which now obtains. To bring this about will require widespread and effective fire protection, with particular attention directed to the reduction of incendiarism, at present the principal cause of forest fires. The poorly stocked forests that now characterize large areas must be built up, and areas where restocking is doubtful or will be long delayed should be planted to trees.

The present timber stand must be carefully utilized and improved through selective cutting, commercial thinnings (particularly in sapling and pole stands), and closer utilization, especially among the lower-grade hardwoods. Integrated use of wood, with each industry consuming as far as possible the class of material best adapted to its needs, should be fostered among all users of forest products. Conservative turpentine practices will contribute substantially toward a lower death rate and a higher growth rate in longleaf and slash pines. Public agencies should assist liberally through budgetary appropriations and tax relief, as well as by the extension of education in the principles of sound woodland management, directed especially toward farmers and owners of small acreages.

In this area the forest industries eventually will use almost exclusively small and medium-sized second-growth timber. Short rotations of 30 to 60 years will probably characterize forest management on private land. Because of the change in conditions now taking place in both the industries and their resources, the next few years should be a very opportune time to promote the principles of good forest management. The private owner of forest land, and particularly the small owner, must be reached directly with a systematic and sustained program of forest education involving fire protection and skillful management. Ultimately the effects of such efforts should increase greatly the volume and the quality of the forest asset of this section, whose future prosperity largely depends upon what it does with its timber resources.